

REMARKS

Claims 41-52, 55-66, 69-80, 83-94 and 97-114 remain pending. Claims 110-114 were renumbered since two claims were added in a preceding response, both of which were inadvertently identified by the number 109. Consistent therewith, dependencies of renumbered claims 110 and 112 have been corrected. No amendments have been made in view of the art of record since Applicants believe that the claims overcome the art of record, as they stand.

The § 102 Rejections

The Examiner rejected Claims 41, 55, 69, 83, 97, 99, 101, 103 and 105-114 under 35 U.S.C. § 102(b) as being anticipated by US Patent no. 4,914,433 issued to Galle. Applicants respectfully disagree, as will be further discussed below.

Initially considering independent claim 41, an arrangement is provided for use in a drilling system for performing underground boring. The system includes a drill rig and a boring tool which is configured for moving through the ground under control of the drill rig to form an underground bore. A detection arrangement is provided at the drill rig for monitoring at least one operational parameter to produce a data signal relating to at least one of a utility to be installed in the underground bore, the drill rig and the boring tool. A portable device is configured for movement by an individual operator and for receiving the data signal relating to the operational parameter for use by the portable device. The portable device includes a display arrangement configured for using the data signal for display to the individual operator of the portable device. A communication arrangement is usable for transferring the data signal from the drill rig to the portable device.

Turning now to the Galle patent, a boring system is described, however, the patent is specifically directed to a wire-in-pipe arrangement for transferring information up the drill string to its above ground end. With reference to figure 4, the patent further describes transferring the information, at column 12, lines 1-11, "by suitable means 231 such as radio waves to surface monitoring and recording equipment 233." Applicants find no further description of this arrangement in the disclosure of Galle. It is noted that Applicants find no teaching in the patent which reasonably suggests a display. Figure 4 appears to show a building as "monitoring and recording equipment 233" having a dish type antenna positioned on its roof for receiving radio waves 231.

In the rejection of claim 41, the Examiner asserts that building 233 is "a portable receiver that is configured for movement by an individual operator." Applicants are unable to find support for this assertion in the Galle patent. In particular, Galle appears to be devoid of any teaching as to a need to move building 233. Further, there is no teaching, disclosure or reasonable suggestion as to how an "individual operator" could move the building. Applicants do not consider that buildings are movable by an individual operator in the manner that is taught by the present application. In this regard, Galle makes no distinction between the building and the "surface monitoring and recording equipment." In contrast, the portable device of the present application is required to be movable by an individual operator. Such a device is illustrated, for example, by figures 2 and 3 of the present application.

In light of the foregoing, it is submitted that a dish type antenna, as is shown by Galle, is unsuited for use in a

portable device that is configured for movement by an individual operator. Dish antennas are intended to be very directional and, as such, are suited for mounting to fixed objects such as buildings. The Galle disclosure is completely consistent in these respects. Specifically, the dish antenna appears to be fixedly mounted to a building, that is itself in a fixed position, while receiving an extremely narrow signal which would miss its mark if the dish antenna were even slightly moved or misdirected. In contrast, Figure 3 of the present application shows a portable device having an omnidirectional antenna 152 provided for telemetry reception. This arrangement effectively accommodates desired movements of the portable device by the individual operator. Applicants consider that Galle fails with respect to teaching, disclosing, or reasonably suggesting a portable device that is movable by an individual operator and, further, that Galle's illustration of a dish antenna teaches directly away from the use of a portable device which is movable by an individual operator. For these reasons, standing on their own, it is submitted that Galle fails to anticipate the claimed combination of limitations that is present in claim 41. Accordingly, allowance of claim 41 is respectfully requested.

Claim 55 is an independent claim which recites monitoring at least one operational parameter at the drill rig using a detection arrangement at the drill rig to produce a data signal relating to at least one of a utility to be installed in the underground bore, the drill rig and the boring tool. The data signal, relating to the operational parameter, is transferred to a portable device that is configured for movement by an individual operator, for use by the portable device which includes a display arrangement. The data signal is used for a display presentation to the individual operator of the portable device. Although this claim is in method form, it is considered to embrace at least the features of claim 41, as described above. Accordingly, it is considered that the arguments made above with respect to the patentability of claim 41 over the art of record are equally applicable with respect to claim 55. For this reason, allowance of claim 55 is respectfully requested.

Claim 69 is an independent claim, in apparatus form, which includes a detection arrangement for monitoring at least one operational parameter which is at least measurable at the drill rig to produce a data signal relating to at least one of a utility to be installed in the underground bore, the drill rig and the boring tool. The portable device is configured for movement by an individual operator thereof and for receiving the data signal relating to the operational parameter for use by the portable device. A display arrangement is configured for using the data signal for display to the individual operator of the portable device. To the extent that these limitations reflect the limitations of claim 41, the arguments made above which favor the patentability of claim 41 over Galle are equally applicable with respect to the patentability of claim 69. Further, claim 69 does not require that parameters are sent up the drill string. In this regard, many parameters such as, for example, push force are directly measurable at the drill rig. As described at column 12, lines 30-34 of the patent, Galle is only concerned with downhole sensors. Applicants find no objective teaching in Galle with respect to drill rig parameter sensing. Accordingly, for at least these reasons, allowance of claim 69 over the art of record is respectfully requested.

Claim 83 is an independent claim, in method form, which reflects the limitations of claim 69. Accordingly, it is considered that the arguments made above with respect to the patentability of claim 69 over the art of record are equally applicable with respect to claim 83. For this reason, allowance of claim 83 is respectfully requested.

Claim 97 is an independent claim, in apparatus form, which includes the limitations of claim 41, as discussed above.

Accordingly, it is considered that the arguments made above with respect to the patentability of claim 69 over the art of record are equally applicable with respect to claim 97. Further, claim 97 includes additional limitations wherein the detection arrangement is configured for detecting a range of the operational parameter for which an out of range condition of the operational parameter can result in a catastrophic equipment failure. Applicants are unable to find any reasonable disclosure of this feature in Galle. Accordingly, it is submitted that Galle fails to anticipate the combinations of limitations that is present in claim 97. For all of these reasons, allowance of claim 97 is respectfully requested.

Claim 99 is an independent claim which includes the limitations of claim 97, as discussed above, but in method form. Accordingly, it is considered that the arguments made above with respect to the patentability of claim 97 over the art of record are equally applicable with respect to claim 99. For at least this reason, allowance of claim 99 is respectfully requested.

Claim 101 is an independent claim, in apparatus form, which recites a detection arrangement for monitoring at least one operational parameter which is at least measurable at the drill rig to produce a data signal relating to at least one of a utility to be installed in the underground bore, the drill rig and the boring tool and configured for detecting a range of the operational parameter for which an out of range condition of the operational parameter can result in a catastrophic equipment failure. Further, a portable device is configured for movement by an individual operator thereof and for receiving the data signal relating to the operational parameter for use by the portable device. A communication arrangement is used for transferring the data signal from the detection arrangement to the portable device. As discussed above with respect to claim 69, Applicants are unable to find any teaching in Galle which reasonably describes a portable device. It is also considered that the use of a dish antenna teaches directly away from the use of a portable device that is configured for use by an individual operator. Further, Applicants find no teaching with respect to drill rig measurable parameters. As also discussed above, with respect to claim 97, Applicants find no teaching in Galle reasonably relating to detecting a range of the operational parameter for which an out of range condition of the operational parameter can result in a catastrophic equipment failure. Arguments made in behalf of claims 69 and 97 over Galle with respect to these limitations are considered to apply equally with respect to claim 101. Accordingly, for at least these reasons, allowance of claim 101 over the art of record is respectfully requested.

Claim 103 is an independent claim which includes limitations which reflects the limitations of claim 101, but in method form. Accordingly, it is considered that the arguments made above with respect to the patentability of claim 101 over the art of record are equally applicable with respect to claim 103. For at least this reason, allowance of claim 103 is respectfully requested.

Claim 105 is an independent claim which reflects certain limitations, discussed above, with respect to claim 41. For example, a detection arrangement is used at the drill rig for monitoring at least one operational parameter to produce a data signal relating to at least one of a utility to be installed in the underground bore, the drill rig and the boring tool. Further, a portable device is configured for movement by an individual operator thereof and for receiving the data signal relating to the operational parameter for use by the portable device and a communication arrangement transfers the data signal from the drill

rig to the portable device. As discussed above, it is considered that Galle not only fails to teach the use of a portable device that is movable by an individual operator, but teaches away from the limitations of claim 105 at least in its use of a highly directional dish antenna which is mounted on the roof of a building.

Dependent Claim 106 is directly dependent from and therefore includes the limitations of Claim 105. Accordingly, it is respectfully submitted that Claim 106 is also patentable over the art of record for at least the reasons set forth above with respect to Claim 105. Further, Claim 106 places additional limitations on Claim 105 which, when considered in its light, further distinguish the claimed invention from the art of record. For example, claim 106 recites a telemetry link for transferring the data signal to the portable device which is movable by an individual operator. It is submitted that the telemetry configuration shown by Galle is unsuitable for this application.

Claim 107 is an independent claim which includes limitations which reflect the limitations of claim 105, but in method form. Accordingly, it is considered that the arguments made above with respect to the patentability of claim 105 over the art of record are equally applicable with respect to claim 107. For at least this reason, allowance of claim 107 is respectfully requested.

Dependent Claim 108 is directly dependent from and therefore includes the limitations of Claim 107. Accordingly, it is respectfully submitted that Claim 108 is also patentable over the art of record for at least the reasons set forth above with respect to Claim 107. Further, Claim 108 places additional limitations on Claim 107 which, when considered in its light, further distinguish the claimed invention from the art of record. For example, claim 108 recites a telemetry link for transferring the data signal to the portable device which is movable by an individual operator. It is submitted that the telemetry configuration shown by Galle is unsuitable for this application.

Claim 109 is an independent claim which reflects certain limitations, discussed above, with respect to claim 101. For example, the detection arrangement monitors at least one operational parameter which is at least measurable at the drill rig to produce a data signal relating to at least one of a utility to be installed in the underground bore, the drill rig and the boring tool. Further, the portable device is configured for movement by an individual operator thereof and for receiving the data signal relating to the operational parameter for use by the portable device. Accordingly, it is considered that the arguments above relating to these limitations apply equally with respect to the patentability of claim 109 over the art of record. Hence, for at least these reasons, allowance of claim 109 is respectfully requested.

Dependent Claim 110 is directly dependent from and therefore includes the limitations of Claim 109. Accordingly, it is respectfully submitted that Claim 110 is also patentable over the art of record for at least the reasons set forth above with respect to Claim 109. Further, Claim 110 places additional limitations on Claim 110 which, when considered in its light, further distinguish the claimed invention from the art of record. For example, claim 110 recites a telemetry link for transferring the data signal to the portable device which is movable by an individual operator. It is submitted that the telemetry configuration shown by Galle is unsuitable for this application.

Claim 111 is an independent claim which includes limitations which reflect the limitations of claim 109, but in method form. Accordingly, it is considered that the arguments made above with respect to the patentability of claim 109 over the art of record are equally applicable with respect to claim 111. For at least this reason, allowance of claim 111 is respectfully requested.

Dependent Claim 112 is directly dependent from and therefore includes the limitations of Claim 111. Accordingly, it is respectfully submitted that Claim 112 is also patentable over the art of record for at least the reasons set forth above with respect to Claim 111. Further, Claim 112 places additional limitations on Claim 111 which, when considered in its light, further distinguish the claimed invention from the art of record. For example, claim 112 recites a telemetry link for transferring the data signal to the portable device which is movable by an individual operator. It is submitted that the telemetry configuration shown by Galle is unsuitable for this application.

Independent claim 113 recites a monitoring arrangement for use in a drilling system for performing an underground boring operation with a drill rig and a boring tool which is configured for moving through the ground using a drill string which extends from the drill rig to the boring tool such that the underground boring operation forms an underground bore. The monitoring arrangement includes a first arrangement for transferring at least one operational parameter through the drill string from the boring tool to the drill rig such that the operational parameter relates to at least one of a utility to be installed in the underground bore, the drill rig and the boring tool. A second arrangement, at least partially located at the drill rig, receives the parameter from the drill string and transmits the operational parameter. A portable device is configured for movement by an individual operator thereof and at least for receiving the operational parameter as transmitted by the second arrangement for use by the portable device. As described above, for example, with respect to certain features that are present in claim 41, it is submitted that Galle fails to teach, disclose or reasonably suggest a portable device that is movable by an individual operator. Moreover, it is considered that Galle teaches away from the use of such portable device through the use of a dish antenna which is not suited for this purpose. For these reasons, standing on their own, it is submitted that Galle fails to anticipate the claimed combination of limitations that is present in claim 113.

Claim 114 is an independent claim which includes limitations which reflect the limitations of claim 113, but in method form. Accordingly, it is considered that the arguments made above with respect to the patentability of claim 113 over the art of record are equally applicable with respect to claim 114. For at least this reason, allowance of claim 114 is respectfully requested.

The § 103 Rejections

The Examiner rejected Claims 42-52, 56-66, 70-80, 84-94, 98, 100, 102 and 104 under 35 U.S.C. § 103(a) as being unpatentable over Galle. Applicants respectfully disagree, as will be further discussed below.

Initially, it is noted that each of independent claims 42-44, 46-48, 50, 56-58, 60-62, 64, 70-72, 74-76, 78, 84-86, 88-90 and 92 include limitations which reflect certain limitations addressed above, for example, with respect to independent

claims 41 and 69. For example, these limitations include the use of a portable device which is configured for movement by an individual operator. Accordingly, the arguments made above, with respect to these limitations, as to the patentability of claim 41 over the art of record, are equally applicable with respect to the patentability of the subject independent claims over the art of record. For these reasons standing on their own, allowance of claims 42-44, 46-48, 50, 56-58, 60-62, 64, 70-72, 74-76, 78, 84-86, 88-90 and 92 is respectfully requested. It is further submitted that these claims include additional limitations, further compelling their patentability over the art of record, as will be discussed immediately hereinafter.

With respect to claims 42, 56, 70 and 84, the Examiner admits that Galle does not explicitly teach the use of a locating signal. The Examiner further states that:

It would have been considered obvious to one having ordinary skill in the art to modify Galle by having at least one of the parameters be a locating signal which is well known in the art in order to be able to locate the position of the drilling tool.

Applicants disagree with the Examiner's position. Initially, it is noted that the boring tool includes a locating signal transmitter which transmits a locating signal through the ground. The portable device includes a locating section for receiving the locating signal in order to identify the underground position of the boring tool. The locating signal is shown as item 98 in figure 2 of the present application and is transmitted from a dipole antenna 94 in the boring tool. The locating section of the portable device, as shown, for example, in figure 3 of the present application, includes at least antennas 122 and 124 along with associated processing circuitry. It is important to understand that the locating signal is transferred through the ground, rather than being transmitted from the drill rig to the portable device. The locating signal must be used directly by the portable locator, it can not be transferred up the drill string, as asserted by the Examiner. In using the locating signal, the portable locator must be moved in a procedure which is used to identify the position of the boring tool, while directly receiving the locating signal from the boring tool. At least one such procedure is described in the incorporated Mercer patents. Such procedures rely on characteristics of the locating field such as, for example, orientation of flux lines and signal strength. These characteristics must be sensed at the portable locator. There is no way to sense such characteristics at the boring tool, since the boring tool in this configuration is itself transmitting the locating signal.

In the above-quoted passage, the locating signal is equated with the parameters which can be transmitted up the drill string, suggesting a modification of Galle which would transfer the locating signal up the drill string. The result of this modification is clearly an inoperable system, since the locating signal, having been transmitted from the boring tool, must be measured by the portable device in order to determine the position of the boring tool. It is submitted that Galle is ineffective as a reference under § 103 for this reason standing on its own.

The Galle reference is considered to be fatally flawed for another reason. It is submitted that the Galle system, as illustrated in figure 4 of the patent is devoid of any need for a locating signal. Figure 4 illustrates a system which forms a vertical borehole. Applicants find no mention in the patent of any capability to form any other type of borehole. Accordingly, the position of the drill head is known simply by knowing the length of the drill string. In view of the Galle patent, one of ordinary skill in the art would have no motivation to modify the Galle drilling system in the suggested manner, since the

position of the boring tool is already known. Monitoring drill string length, so as to ascertain the depth coordinate, is trivial. It is submitted that the subject independent claims are allowable over Galle for this reasons standing on its own.

Still another fatal flaw is considered to be implicated in the use of Galle as a reference. It is mentioned, in this regard, that locating capabilities are of the greatest benefit in steerable horizontal drilling systems such as illustrated in figure 2 of the present application. Typically, dipole locating fields are used such as illustrated in Figures 1a and 1b of US Patent no. 5,155,442, one of the Mercer patents. What is problematic, in this regard, resides in the use of such a locating signal in a vertically oriented drilling system, such as is illustrated by Galle. Specifically, the field points that must be found in order to ascertain the position of the boring tool, are completely inaccessible in a vertical drilling system. That is, finding these field points requires movement of the portable device that is along the length of, but spaced apart from the drill string. Once the transmitter is underground in Galle, the field points of most interest are completely inaccessible. In particular, what is normally the overhead point in a horizontally oriented system is essentially useless when it is underground. Hence, one having ordinary skill in the art would have no motivation to modify Galle in order to add such meaningless locating signal capability. The result would be a system which is inoperable for its intended purpose. Accordingly, for all of these reasons, it is respectfully submitted that Galle fails to teach, disclose or reasonably suggest the combined limitations of claims 42, 56, 70 and 84 and that these claims are patentable over the art of record.

With respect to independent claims 43, 47, 57, 61, 71, 75, 85 and 89, each of these claims includes limitations relating to the use of push force as an operational parameter.

For example, claim 43 recites a push force sensing arrangement which generates a push force signal for inclusion as at least a portion of the data signal. Claim 57 includes similar limitations, but in method form.

As another example, claim 47 recites a detection arrangement which produces the data signal responsive to exceeding a maximum push force. In addition, the portable device is configured for receiving the data signal relating to the operational parameter for use by the portable device and is further configured to provide an indication of violation of the maximum push value when the maximum push value is exceeded. Claim 61 includes similar limitations, but in method form.

As a further example, claim 71 recites a detection arrangement for monitoring at least one operational parameter which is at least measurable at the drill rig to produce a data signal relating to at least one of a utility to be installed in the underground bore, the drill rig and the boring tool and which generates a push force signal for inclusion as at least a portion of the data signal. Claim 85 includes limitations which resemble those of claim 71, but in method form.

As yet another example, claim 75 recites that a maximum push value is established beyond which the boring tool may be damaged, and the detection arrangement produces the data signal responsive to exceeding the maximum push value. The portable device is configured to provide an indication of violation of the maximum push value when the maximum push value is exceeded. Claim 89 includes limitations which are similar to those of claim 75, but in method form.

With respect to all of these limitations, the Examiner admits that:

Galle does not explicitly teach that one of the parameters is a push force signal. Push force signals are well known and old parameters when boring. It would have been obvious to modify Galle by having at least one of the parameters be a push force signal...

Applicants respectfully disagree. Applicants are unaware of a push force signal in the prior art. Applicants consider that the subject claims are allowable over Galle for this reason standing on its own. Moreover, Applicants are unaware of any teaching in the prior art which reasonably discloses, teaches or suggests the more detailed limitations which are embraced by these claims such as, for example, providing an indication of violation of maximum push value in claims 47 and 61; generating a push force signal for inclusion as at least a portion of the data signal in claims 71 and 85; and generating the push force signal when the maximum push value has been exceeded in claims 75 and 89. Accordingly, allowance of claims 43, 47, 57, 61, 71, 75, 85 and 89 is respectfully requested.

Claim 98 is a dependent claim which depends directly from independent claim 97. Accordingly, it is considered that claim 98 is patentable over Galle for at least the reasons given above with respect to the rejection of claim 97 under § 102. Further, claim 98 recites that the detection arrangement is configured for detecting the operational parameter as at least one of a push force which drives the boring tool, a temperature of the boring tool, a pressure of a drilling mud that is supplied to the boring tool, a status of a battery used in the boring tool, a curvature of the underground bore and a proximity of the boring tool to an underground utility. The Examiner admits that Galle does not explicitly teach signals relating to these parameters, but nonetheless rejects claim 98 with specific reference to the asserted obviousness of a push force signal. Applicants respectfully disagree and are unaware of the use of such a signal in the prior art being transferred to a portable device. Further, Applicants are unaware of the use of such a temperature or drilling mud pressure signal, boring tool battery status, proximity to an underground utility or some combination of these signals. Accordingly, for at least these reasons, allowance of claim 98 is respectfully requested.

Claim 100 is a dependent claim which depends directly from independent claim 99. Accordingly, it is considered that claim 100 is patentable over Galle for at least the reasons given above with respect to the rejection of claim 99 under § 102. Further, claim 100 recites limitations which reflect those of claim 98, but in method form. Accordingly, the arguments made above in favor of the patentability of claim 98 over Galle are equally applicable with respect to the patentability of claim 100. For at least this reason, allowance of claim 100 is respectfully requested.

Claim 102 is a dependent claim which depends directly from independent claim 101. Accordingly, it is considered that claim 102 is patentable over Galle for at least the reasons given above with respect to the rejection of claim 101 under § 102. Further, claim 102 recites limitations which reflect those of claim 98. Accordingly, the arguments made above in favor of the patentability of claim 98 over Galle are equally applicable with respect to the patentability of claim 102. For at least this reason, allowance of claim 102 is respectfully requested.

Claim 104 is a dependent claim which depends directly from independent claim 103. Accordingly, it is considered that claim 104 is patentable over Galle for at least the reasons given above with respect to the rejection of claim 103 under § 102. Further, claim 104 recites limitations which reflect those of claim 98, but in method form. Accordingly, the arguments

made above in favor of the patentability of claim 98 over Galle are equally applicable with respect to the patentability of claim 104. For at least this reason, allowance of claim 104 is respectfully requested.

With respect to claims 44-46, 58-60, 72-74 and 86-88, the Examiner admits that Galle fails to teach that one of the parameters is a predetermined value. These claims, however, are not merely directed to the use of predetermined values, but are concerned with the generation of warnings for issuance at the portable device as will be addressed below with regard to each of these claims.

Claims 44, 46, 58, 60, 72, 74, 86 and 88 are independent claims which embrace limitations which encompass warnings. For example, claim 44 recites that the operational parameter is capable of violating at least a selected one of a minimum and a maximum predetermined value. Further, a communication arrangement is configured for transferring, as part of the data signal, a warning to the portable device that the selected predetermined value has been violated. Applicants are unable to find any reasonable teaching, disclosure or suggestion of such a feature in Galle. Accordingly, for at least this reason allowance of claim 44 is respectfully requested.

Claim 46 recites that the operational parameter is capable of violating at least a selected one of a minimum and a maximum predetermined value. Further, the portable device is configured for issuing a warning that the selected predetermined value has been violated. Applicants are unable to find any reasonable teaching, disclosure or suggestion of such a feature in Galle. Accordingly, allowance of these claims is respectfully requested. Accordingly, for at least this reason allowance of claim 46 is respectfully requested.

Claims 58 and 60 include limitations which reflect those of claims 44 and 46, respectively, but in method form. Accordingly, it is submitted that claims 58 and 60 are also patentable over the art of record for at least the reasons given above with respect to claims 44 and 46.

Claim 72 recites a detection arrangement for monitoring at least one operational parameter which is at least measurable at the drill rig to produce a data signal relating to at least one of a utility to be installed in the underground bore, the drill rig and the boring tool and the operational parameter is capable of violating at least a selected one of a minimum and maximum predetermined value. A communication arrangement transfers the data signal from the detection arrangement to the portable device and is configured for transferring, as part of the data signal, a warning to the portable device that the predetermined value has been violated. Applicants submit that the art of record is devoid of this combination of features. Applicants are unable to find any reasonable teaching, disclosure or suggestion of such a combination of features in Galle. Accordingly, for at least this reason allowance of claim 72 is respectfully requested.

Claim 74 recites a detection arrangement for monitoring at least one operational parameter which is at least measurable at the drill rig to produce a data signal relating to at least one of a utility to be installed in the underground bore, the drill rig and the boring tool and the operational parameter is capable of violating at least a selected one of a minimum and maximum predetermined value. A portable device for receiving the data signal relating to the operational parameter for use

by the portable device and is further configured for issuing a warning that the selected predetermined value has been violated. Applicants submit that the art of record is devoid of this combination of features under any reasonable light. Accordingly, for at least this reason allowance of claim 74 is respectfully requested.

Claims 86 and 88 include limitations which reflect those of claims 72 and 74, respectively, but in method form. Accordingly, it is submitted that claims 86 and 88 are also patentable over the art of record for at least the reasons given above with respect to claims 72 and 74.

With respect to claims 48, 49, 62, 63, 76, 77, 90 and 91, the Examiner admits that Galle does not explicitly teach that one of the parameters is a mud signal, but nonetheless rejected these claims on the basis that:

Mud signals are known and old parameters when boring. It would have been obvious to one skilled in the art to modify Galle by having at least one of the parameters be a mud signal...

It is of interest to note that Galle mentions drill mud at numerous points in its specification, since Galle teaches a system for replacing a conventional mudpulse telemetry system in the drill string. Despite all these instances of discussion of drill mud, however, Galle appears to be completely devoid of any mention of a drill mud signal. Accordingly, for at least this reason, allowance of these claims is respectfully requested. Moreover, these claims encompass still more detailed features as will be addressed immediately hereinafter.

Claims 48, 62, 76 and 90 are independent claims which include more detailed limitations. For example, claims 48 and 76 recite that the operational parameter is a status of the drilling mud for inclusion as at least a portion of the data signal. Claims 62 and 90 reflect the limitations of claims 48 and 76, respectively, but in method form. Applicants find no mention or reasonable suggestion of drill mud status as part of a telemetry signal in Galle. Accordingly, allowance of claims 48, 62, 76 and 90 is respectfully requested.

Claims 49, 63, 77 and 91 are dependent claims which depend directly from claims 48, 62, 76 and 90, respectively, and therefore include the limitations of their parent claim. Accordingly, it is respectfully submitted that each of these dependent claims is also patentable over the art of record for at least the reasons set forth above with respect to its parent claim. Further, each of these dependent claims places additional limitations on its parent claim which, when considered in its light, further distinguish the claimed invention from the art of record.

For example, claims 49 and 77 recite that the portable device is configured to provide a warning based on the status of the drill mud. Claims 77 and 91 reflect the limitations of claims 49 and 77, respectively, but in method form. Applicants are unable to find any reasonable teaching, disclosure or suggestion of such a feature in Galle. Accordingly, allowance of these claims is respectfully requested.

With regard to claims 50-52, 64-66, 78-80 and 92-94, it is noted that each of these claims includes limitations relating to the bend radius of the drill string as a parameter. The Examiner admits that Galle does not explicitly teach that one of the parameters is a bend radius signal, but nonetheless rejects these claims by asserting that a bend radius signal is

well known and that it would be obvious to modify Galle to include such a bend radius signal. Initially, Applicants note that Galle appears to be configured for use in a vertically oriented borehole as is clearly illustrated by Figure 4 of the patent. For this reason, Galle is devoid of any need for a bend radius signal. Seen in this light, Applicants would have no motivation to modify Galle in the suggested manner. Allowance is respectfully requested for this reason standing on its own. Moreover, each of these claims include detailed limitations which still further distinguish over Galle, as will be discussed immediately hereinafter.

Claims 50, 64, 78 and 92 are independent claims which include more detailed limitations. For example, claim 50 recites a drill path monitoring arrangement, at the drill rig, for monitoring curvature of the underground bore being formed by the boring tool as the operational parameter and for comparing at least a selected one of the minimum bend radius of the drill string and the minimum bend radius of a utility to be installed in the boring tool with the curvature of the underground bore to form at least a portion of the data signal. Claim 64 reflects the limitations of claim 50, but in method form. It is noted that Galle illustrates a straight borehole and, as such, provides no motivation for monitoring borehole curvature with respect to any bend radius. Moreover, it is submitted that Galle illustrates well drilling, as opposed to forming a borehole for purposes of subsequently installing a utility therein. Applicants submit that Galle, viewed reasonably, is completely devoid of any teaching, disclosure or reasonable suggestion of this combination of limitations. For at least these reasons, allowance of claims 50 and 64 is respectfully requested.

Dependent Claims 51 and 52 are each either directly or indirectly dependent from and therefore include the limitations of Claim 50. Accordingly, it is respectfully submitted that each of these claims is also patentable over the art of record for at least the reasons set forth above with respect to Claim 50. Further, each of these dependent claims places additional limitations on their parent and intermediate claims which, when considered in light of Claim 50, further distinguish the claimed invention from the art of record.

For example, claim 51 recites that the portable device is configured for indicating that the selected minimum bend radius is being violated. Applicants find no reasonable teaching, disclosure or suggestion of this limitation in Galle.

As another example, claim 52 recites that the selected minimum bend radius is a greater one of the minimum bend radius of the drill string and the minimum bend radius of the utility and the portable device is configured to provide an indication of violation of the greater minimum bend radius. Applicants find no reasonable teaching, disclosure or suggestion of this limitation in Galle.

Dependent Claims 65 and 66 are each either directly or indirectly dependent from and therefore include the limitations of Claim 64. Accordingly, it is respectfully submitted that each of these claims is also patentable over the art of record for at least the reasons set forth above with respect to Claim 64. Further, each of these dependent claims places additional limitations on their parent and intermediate claims which, when considered in light of Claim 64, further distinguish the claimed invention from the art of record. For example, claims 65 and 66 include limitations which reflect those of claims 51 and 52, but in method form. Accordingly, it is respectfully submitted that claims 65 and 66 are allowable over the art of

record for at least the reasons given above with respect to claims 51 and 52, respectively.

Claim 78 is an independent claim which reflects the limitation discussed above with respect to claim 50 wherein a detection arrangement monitors curvature of the underground bore being formed by the boring tool as the operational parameter and compares at least a selected one of the minimum bend radius of the drill string and the minimum bend radius of the utility with the curvature of the underground bore to form at least a portion of the data signal. Claim 92 reflects this limitation, but in method form. Accordingly, it is submitted that claims 78 and 92 are allowable over the art of record at least for the reasons given above with respect to claim 50.

Dependent claims 79 and 80 are each either directly or indirectly dependent from and therefore include the limitations of claim 78. Accordingly, it is respectfully submitted that each of these claims is also patentable over the art of record for at least the reasons set forth above with respect to claim 78. Further, each of these dependent claims places additional limitations on their parent and intermediate claims which, when considered in light of Claim 78, further distinguish the claimed invention from the art of record. For example, claims 79 and 80 include limitations which reflect those of claims 51 and 52, but in method form. Accordingly, it is respectfully submitted that claims 79 and 80 are allowable over the art of record for at least the reasons given above with respect to claims 51 and 52, respectively.

Claim 92 is an independent claim which reflects the limitations of claim 78, but in method form. Therefore, the arguments made above with respect to the patentability of claim 78 over Galle are considered as equally applicable with respect to the patentability of claim 92. For at least this reason, allowance of claim 92 is respectfully requested.

Dependent claims 93 and 94 are each either directly or indirectly dependent from and therefore include the limitations of claim 92. Accordingly, it is respectfully submitted that each of these claims is also patentable over the art of record for at least the reasons set forth above with respect to Claim 92. Further, each of these dependent claims places additional limitations on their parent and intermediate claims which, when considered in light of Claim 92, further distinguish the claimed invention from the art of record. For example, claims 93 and 94 include limitations which reflect those of claims 51 and 52, but in method form. Accordingly, it is respectfully submitted that claims 93 and 94 are allowable over the art of record for at least the reasons given above with respect to claims 51 and 52, respectively.

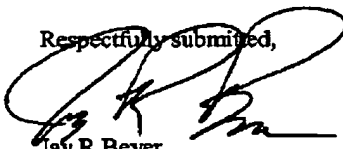
With respect to claimed features such as, for example, a locating signal, a push force signal, a mud signal, a temperature signal and a bend radius signal, it appears that the Examiner may be relying on personal knowledge in suggesting that the proposed modifications are obvious wherein the Examiner is taking Official Notice of a matter of common knowledge in the art. If this continues to be the case in light of the arguments presented herein, Applicants respectfully traverse the rejection on these grounds and request an express showing of documentary proof, or an affidavit, as required by MPEP § 2144.03, in the event the rejection is maintained on these grounds. Accordingly, for all of these reasons, allowance of amended claim 49 is respectfully requested.

For the foregoing reasons, it is respectfully submitted that all of the Examiner's objections have been overcome and

that the application is in condition for allowance. Hence, allowance of these claims and passage to issue of the application are solicited.

If the Examiner has any questions concerning this case, the Examiner is respectfully requested to contact Mike Pritzkau at 303-410-9254.

Respectfully submitted,



Jay R Beyer
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